

Chapter 6: Polygons

Section 6: Trapezoids and kites

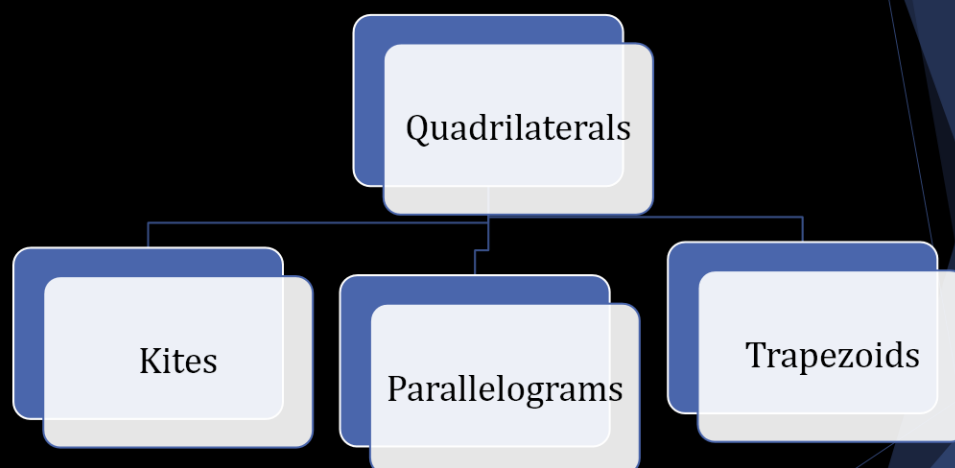
Key Learning Objective: quadrilaterals that are *not* parallelograms.

- ▶ Until now all of the quadrilaterals we have seen have been *parallelograms*.
- ▶ There are two more types of quadrilaterals that are *not* parallelograms: **kites** and **trapezoids**.

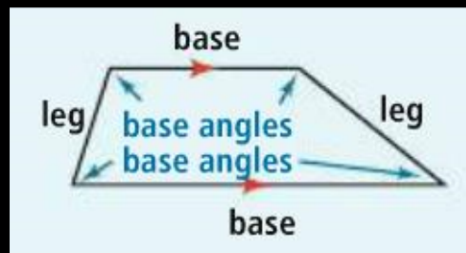
Basic properties of kites and trapezoids

- ▶ **Kites** have exactly one pair of congruent angles. They have no parallel sides.
- ▶ **Trapezoid** have one pair of parallel sides.
- ▶ **Isosceles Trapezoids** have base angles that are congruent and opposite adjacent angles (same-side interior) that are supplemental.

Visualization: kites and trapezoids

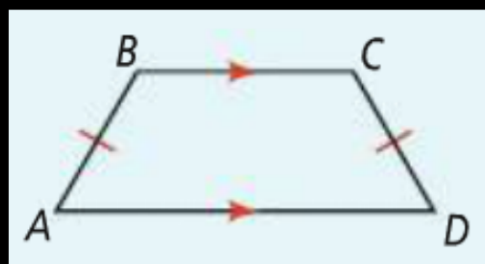


Trapezoids



- ▶ A trapezoid is a quadrilateral with exactly one pair of parallel sides. Those sides are called *bases* and the other pair of sides are called *legs*. The angles at each end of the base are called *base angles*.

Isosceles Trapezoids

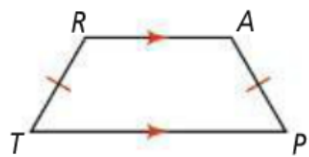


- ▶ An isosceles trapezoid is a trapezoid with congruent legs. The angles of an isosceles trapezoid have unique properties.

Theorem 6-19

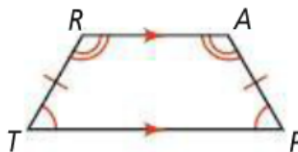
If . . .

$TRAP$ is an isosceles trapezoid
with bases \overline{RA} and \overline{TP}



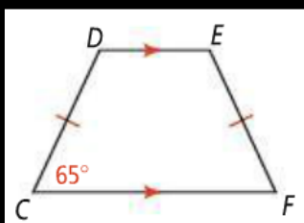
Then . . .

$\angle T \cong \angle P$, $\angle R \cong \angle A$



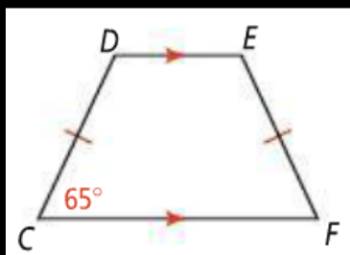
- ▶ Given an isosceles trapezoid with bases \overline{RA} and \overline{TP} , angles $\angle T \cong \angle P$ and $\angle R \cong \angle A$.

Finding missing angle measures



- ▶ What are angles $\angle D$, $\angle E$ and $\angle F$?
- ▶ Step 1: What are the properties of base angles? What does that make angle F?
- ▶ Step 2: What is angle D? How do we know?
- ▶ Step 3: What is angle E?

Finding missing angle measures



- The properties of the polygon will always tell us how to solve for missing angles and sides!

$m\angle C + m\angle D = 180$ Two angles that form same-side interior angles along one leg are supplementary.

$65 + m\angle D = 180$ Substitute.

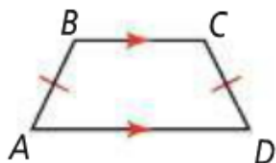
$m\angle D = 115$ Subtract 65 from each side.

Since each pair of base angles of an isosceles trapezoid is congruent, $m\angle C = m\angle F = 65$ and $m\angle D = m\angle E = 115$.

Theorem 6-20

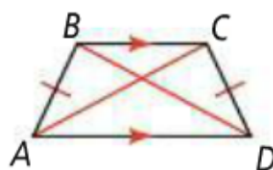
If ...

$ABCD$ is an isosceles trapezoid



Then ...

$\overline{AC} \cong \overline{BD}$

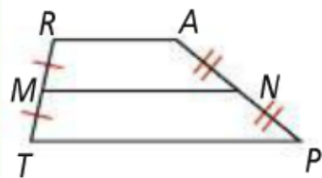


- If a quadrilateral is an isosceles trapezoid, then its diagonals are congruent.

Theorem 6-21: trapezoid midsegments

If . . .

$TRAP$ is a trapezoid with midsegment \overline{MN}



Then . . .

(1) $\overline{MN} \parallel \overline{TP}$, $\overline{MN} \parallel \overline{RA}$, and

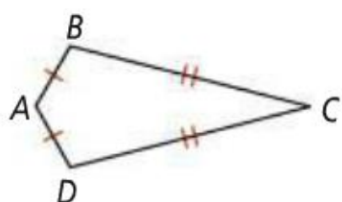
(2) $MN = \frac{1}{2} (TP + RA)$

- ▶ The midsegment of a trapezoid is parallel to the bases and half the sum of the length of the bases.

Theorem 6-22

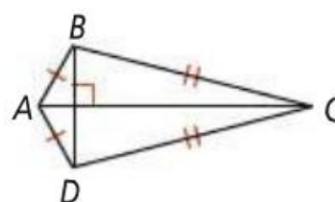
If . . .

$ABCD$ is a kite



Then . . .

$\overline{AC} \perp \overline{BD}$



- ▶ If $ABCD$ is a kite then its diagonals are perpendicular.

Summary

